

**INSTRUCTION MANUAL**  
**INDUSTRIAL ROBOT SR-HSP SERIES**  
**CLEAN SPECIFICATIONS**

**Notice**

1. Make sure that this instruction manual is delivered to the final user of the Toshiba Machine's industrial robot.
2. Be sure to read this manual before installing and operating the Toshiba Machine's industrial robot.
3. Keep the manual nearby for future reference during use of the robot.

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## Preface

Toshiba Machine's SR–HSP–CR series system robot is designed and manufactured as per the clean specifications, taking over the high-speed and high-precision performance characteristics of the standard SR–HSP series robot.

This manual describes the difference in structure, wiring, piping and maintenance of the basic robot from the standard specifications. Before actually unpacking, you are requested to look through this manual.

Also, before using this manual, please understand the name and function of each part, referring to the Transportation and Installation Manual and Maintenance Manual.

This manual consists of the following four (4) sections.

Section 1      Cautions on Safety

This section deals with the important information on using the robot safely and properly.

Section 2      Clean Robot Basic specifications

This section describes the basic specifications, outer dimensions and operating range of the robot.

Section 3      Measures against Dust

This section stipulates the measures against dust when using the robot of clean specifications.

Section 4      Maintenance and Inspection

This section describes the difference in maintenance and inspection of the basic robot from the standard specifications.

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## Section 1 Cautions on Safety

This manual contains the important information to prevent the operators and persons nearby from injuries, to prevent damage to assets and to ensure correct use.

Make sure that you well understand the following details (indications and symbols) before reading this manual. Always observe the information that is noted.

[Explanation of indications]

Indication	Meaning of indication
<b>Danger</b>	This means that "incorrect handling will lead to fatalities or serious injuries."
<b>Caution</b>	This means that "incorrect handling may lead to personal injuries *1) or physical damage *2)."

\*1) Injuries refer to injuries, burns and electric shocks, etc., which do not require hospitalization or long-term medical treatment.

\*2) Physical damage refers to damages due to destruction of assets or resources.

[Handling the clean robot]

<b>Caution</b>
<ul style="list-style-type: none"><li>• Take note that the type of grease used for the ball screw and spline differs from the standard specifications. Failure to observe this could cause deterioration of robot performance and malfunction.</li><li>• The customer should NEVER change or modify the parts other than those stipulated in the instruction manual.</li><li>• For part replacement, be sure to use the spare parts designated by Toshiba Machine.</li><li>• Carry out the maintenance and inspection regularly. Unless they are executed, an abnormality or malfunction cannot be found, resulting in accidents.</li></ul>

## Section 2 Clean Robot Basic Specifications

### 2.1 Basic Robot Specifications

Table 2.1 shows the basic specifications of the clean robot.

Table 2.1 Basic robot specifications

Model		SR-654HSP-CR	SR-1054HSP-CR
Arm length	Full length	650 mm	1,050 mm
	Arm 1	350 mm	580 mm
	Arm 2	300 mm	470 mm
Operating range	Axis 1	±115°	±115°
	Axis 2	±140°	±145°
	Axis 3 (vertical)	185 mm	185 mm
	Axis 4 (wrist rotation)	±280°	±360°
Maximum speed	Axis 1	255°/s	170°/s
	Axis 2	360°/s	270°/s
	Axis 3 (vertical)	800 mm/s	800 mm/s
	Axis 4 (wrist rotation)	864°/s	576°/s
	Composite	4.77 m/s	5.33 m/s
Load	Mass of workpiece to be carried	5 kgf (rated) (Max. 10 kgf)	10 kgf (rated) (Max. 20 kgf)
	Permissible inertia moment at the tip	0.0663 kgf·m <sup>2</sup>	0.1 kgf·m <sup>2</sup>
Repeatability	X, Y (plane)	±0.02 mm	±0.03 mm
	Axis 3 (vertical)	±0.01 mm	±0.02 mm
	Axis 4 (wrist rotation)	±0.03°	±0.03°
Tool wiring and air piping		12 cables and 2 pipelines	
Degree of cleanliness		Designed for cleanliness 10 (* Note 1)	
Drive system		AC servo motor	
Mass of the basic body		65 kgf	95 kgf
Robot controller		SR7000	

Note 1: Cleanliness 10:

When this robot is operated in the clean bench (cleanliness 1 or less) installed in the downflow clean room, the number of fine particles of 0.3 μm or over contained in 1 ft<sup>3</sup> as measured in the plane of the lower end position of axis 3 stroke is ten (10) or less.

Air speed of downflow is 0.3 ~ 0.5 m/s.

## 2.2 Outer Dimensions

Figures 2.1 and 2.2 show the external view of the basic robot.

Figure 2.1 SR-654HSP-CR external view

Figure 2.2 SR-1054HSP-CR external view



### **2.3 Operating Range and Coordinate System**

For the clean specifications, the operating range of axis 3 (vertical) is smaller than the standard specifications.

When installing the robot, review the layout after confirming the operating range shown in Figures 2.3 and 2.4.

The zero point of the base coordinate system and each joint angle is the same as in the standard specifications.

Figure 2.3 SR-654HSP-CR operating range

Figure 2.4 SR-1054HSP-CR operating range

## **2.4 Tool Wiring and Piping**

This paragraph describes the wiring and air piping for the tool.

### **2.4.1 Tool Wiring**

For the tool wiring, see the descriptions on tool wiring (Para. 4.2.2) included in the Transportation and Installation Manual.

For the wiring, be sure to use the connector at the lower side of arm 2.

### **2.4.2 Tool Air Piping**

In all, two (2) air pipelines (outer dia. 6 mm × inner dia. 4 mm) are available for the tool. Figures 2.5 and 2.6 show the joint locations of these pipelines.

Lower side of arm 2

Rear side of fixed base

Figure 2.5 Location of SR-654HSP-CR piping joint

Lower side of arm 2

Rear side of fixed base

Figure 2.6 Location of SR-1054HSP-CR piping joint

### **Section 3 Specific Measures**

- 1) **Ball screw and spline**  
The ball screw and spline shafts are hard chrome plated.  
Balls of the ball screw nut and spline nut are made of stainless steel.  
They are lubricated with clean fluorine base grease.
- 2) **Axis 4 rotating unit**  
The axis 4 rotating unit has a labyrinth structure.
- 3) **Robot internal scavenging**  
The arm 2 cover interior and axis 4 rotating unit are scavenged by means of an air tube.
- 4) **Totally enclosed structure**  
The arm 2 cover is equipped in such a manner that there is no clearance with the arm. Additionally, they are completely sealed with sealant to prevent dust flow into the outside and to increase negative pressure.
- 5) **Painting**  
Melamin baking finish is used for all painting.
- 6) **Bolt and air fitting**  
All bolts exposed are made of SUS304.  
All air fittings exposed are non-electrolytic nickel plated.
- 7) **User's wiring and piping**  
The user's wiring and piping run under the arm 2.  
The user's wiring can be easily removed and attached by means of a round connector.
- 8) **Assembly and test**  
Assembly and test are conducted in the clean booth of class 10000.
- 9) **Packing**  
After cleaning the robot exterior with alcohol, the entire robot is packed in a polyethylene bag for delivery.

As no clean measures are taken on controller SR7000, take utmost care of the place where it is to be installed.

### **3.2 Scavenging Piping in the Robot**

An air tube is incorporated in the clean robot for scavenging.

Figures 3.1 and 3.2 show the piping of the air tube.

When operating the robot as the clean robot, scavenge through the air fitting, using a scavenging vacuum pump (or equivalent to be provided by the user). Yardstick for the scavenging volume is 75 liters/min.

If the robot is operated without scavenging, the specified degree of cleanliness cannot be maintained.

Figure 3.1 SR-654HSP-CR scavenging air piping

Figure 3.2 SR-1054HSP-CR scavenging air piping

### **3.3 Sealing Robot Cover**

To maintain a better effect, the clean robot cover is filled up with sealant to eliminate any clearance and to realize a totally closed robot structure. Dust in the robot will not flow into the outside.

Except for the internal inspection and adjustment, DO NOT remove the cover.

## **Section 4 Maintenance and Inspection**

### **4.1 Maintenance and Inspection Items**

The maintenance and inspection schedule and inspection items are the same as in the standard specifications. For details, see Section 1 of the Maintenance Manual. Bear in mind that the type of grease for the ball screw and spline differs from the standard specifications.

### **4.2 Lubricating Tool Shaft and Tool Shaft Support Bearing**

For the tool shaft, use the following grease.

- FONBLINE Grease OT-20 (maker: AUSIMONT)

For the greasing, see Para. 2.3.4 of the Maintenance Manual (STE 58766).

#### **Caution**

- Be sure to select the proper grease. If the wrong grease is selected, the robot performance will deteriorate, resulting in malfunction.

#### 4.4 Replacement Parts List for Maintenance of Robot Mechanism

Table 4.1 SR-654HSP-CR replacement parts list for maintenance

Part name	Dwg. No./Type	Maker	Q'ty	Remarks
AC servo motor	T-Z06030S-OU001	Toshiba Machine	1	For axis 1
	T-Y04030S-OU001		1	For axis 2
	T-Z02030S-BOU002		1	For axis 3
	T-Y01030S-BOU001		1	For axis 4
Harmonic drive	P0712544P1	Harmonic	1	For axis 1
	P0713566P1	Drive Systems	1	For axis 2
Planetary reduction gear	K0713184P1	Toshiba Machine	1	For axis 4
Timing belt	73113×9	UNITTA	1	For axis 3
	75113×20		1	For axis 4
Timing pulley	K0713127P1	Toshiba Machine	1	For axis 3
	K0713126P1		1	For axis 3
	K0713128P1		1	For axis 4
	K0713125P1		1	For axis 4
Ball screw, spline	P0712543P3			Clean spec.
Sensor	AN9145	Matsushita Controls	7	For axes 1, 2 & 4
	GXL-8FB		3	For axis 3
	RS-1SH	Japan Automation	1	For axis 4
Harness	T0711393G1	Toshiba Machine	1	
Grease	SK-1A	Harmonic Drive Systems	500 g, 2.5 kg	
	OT-20	AUSIMONT	100 g	

#### Caution

- All items other than the sensor and grease listed above are options. When purchasing them, place an order with us.
- NEVER replace the parts by the customer.

Table 4.2 SR-1054HSP-CR replacement parts list for maintenance

Part name	Dwg. No./Type	Maker	Q'ty	Remarks
AC servo motor	T-Z06030S-OU001	Toshiba Machine	1	For axis 1
	T-Y04030S-OU001		1	For axis 2
	T-Y02030S-BOU001		1	For axis 3
	T-Z02030S-BOU002		1	For axis 4
Harmonic drive	P0712555P1	Harmonic Drive Systems	1	For axis 1
	P0712544P1		1	For axis 2
	M0713610P1		1	For axis 4
Timing belt	73167×9	UNITTA	1	For axis 3
	75172×25		1	For axis 4
Timing pulley	K0713159P1	Toshiba Machine	1	For axis 3
	K0713126P1		1	For axis 3
	K0713158P1		1	For axis 4
	K0713160P1		1	For axis 4
Ball screw, spline	P0712543P3			Clean spec.
Bearing	6200ZZ		3	For axis 4
	6810DDU		1	Contact rubber seal
Sensor	AN9145	Matsushita Controls	7	For axes 1, 2 & 4
	GXL-8FB		3	For axis 3
	RS-1SH	Japan Automation	1	For axis 4
Harness	T0711405G1	Toshiba Machine	1	
Grease	SK-1A	Harmonic Drive Systems	500 g, 2.5 kg	
	OT-20	AUSIMONT	100 g	

### Caution

- All items other than the sensor and grease listed above are options. When purchasing them, place an order with us.
- NEVER replace the parts by the customer.



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1			
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## BARAUCHI

### Page 3 (in Japanese version)

- (1) 4- $\varnothing$ 18 hole, counterbore 26
- (2) Controller cable
- (3) Cable length
- (4) 2- $\varnothing$ 22 hole
- (5) User's air fitting
- (6) Scavenging air fitting
- (7) Max. 1000

### Page 4

- (1) 4- $\varnothing$ 18 hole, counterbore 26
- (2) Controller cable
- (3) Cable length
- (4) 2- $\varnothing$ 22 hole
- (5) User's air fitting
- (6) Scavenging air fitting
- (7) Max. 950

### Page 6

- (1) Hand wiring connector
- (2) Pipeline B
- (3) Pipeline A
- (4) Pipeline A
- (5) Pipeline B
- (6) Scavenging air fitting
- (7) Hand wiring connector
- (8) Pipeline B
- (9) Pipeline A
- (10) Pipeline A
- (11) Pipeline B
- (12) Scavenging air fitting

### Page 8

- (1) Scavenging in arm 2
- (2) Union Y-bend
- (3) Scavenging of axis 4 rotating unit

- (4) Air tube (O.D. 6 mm × I.D. 4 mm)
- (5) Elbow
- (6) Tool air fitting
- (7) Scavenging air fitting

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- (1) Scavenging in arm 2
- (2) Union Y-bend
- (3) Scavenging of axis 4 rotating unit
- (4) Air tube (O.D. 6 mm × I.D. 4 mm)
- (5) Elbow
- (6) Tool air fitting
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